oblong, acuminated gradually, and sharply attenuated at the apex, rounded or subtruncated, and somewhat inæquilateral at base, 3 inches long, $1\frac{5}{8}$ inch broad, upon a thick short petiole of 2 lines in length. The flowers, sometimes in pairs, grow laterally at the base of the petiole; the peduncle is refracted, $\frac{3}{4}$ to 1 inch long, and covered with long glandular hairs mixed with shorter stellate pubescence; the calyx, also tomentose, is 8 lines long, 6 lines across, inclosing a small globular berry 4 lines in diameter.

XVIII.—*On the Animal of* Kellia rubra.

By W. Clark, Esq.

To the Editors of the Annals of Natural History.

Gentlemen, Beacon Hill, Exmouth, Devon, July 5, 1849.

I venture to trouble you with a few observations in reply to Mr. Alder's last paper, in the 'Annals' of this month, on the subject of *Kellia rubra*, and then I hope to retire from the field. I have had ample scope allowed; and though you have not interrupted the discussion, by issuing the editorial veto,

"Claudite jam rivos, pueri, sat prata biberunt,"

still we ought to keep in mind the phrase,

"Est modus in rebus."

Mr. Alder still continues to rely on the point that the regular ingress and egress of the branchial currents, and the regulation thereof, in the bivalve mollusca, are produced by the action of the vibratile cilia, which clothe the branchial laminæ; I differ from his views, and think this doctrine entitled to no confidence, and that the cause is inadequate to the effect propounded.

The branchial cilia have very different functions; their sole use is to beat and subdivide the water, to facilitate the elimination of the vital principle therefrom, *after it has been admitted into the branchial cavity* by the opening of the valves of the animal, by the relaxation of the adductor muscles, and from whence the impure water is discharged by their contraction at the same points, ventral or siphonal, or a combination of both, as the animal may happen to be closed, or open mantled, at which it enters, and a fresh supply of the pure element is received to fill the vacuum caused by its expulsion.

Great misapprehension has arisen from confounding the functions of two different sets of organs, attributing to the one the uses of the other, the real functions of which have altogether been unnoticed.

The assumed regularity of the admission and discharge of the

branchial currents is a sad mistake; nothing can be more irregular, capricious, and uncertain; they depend entirely on the volition, habits, and wants of the animal, and are often suspended for weeks in *Kellia rubra*, and twice in every twenty-four hours in the mussels and numerous Gasteropoda inhabiting the higher levels of the littoral zone.

I positively dissent from Mr. Alder's views, repeated in his last paper, that the open fold of *Kellia rubra* is a *special* branchial organ. That the water enters therein no one disputes, inasmuch as this fold is a simple continuation of the ventral portion of the mantle, and the water must flow therein, as it does in every other part of an open mantle. This sentiment is a repetition of one in a former paper; but it is necessary to keep it in view, to show that the fold in question has no pretensions, as I think, to be considered as a *special* branchial organ to supply the want of one in the usual place nature is always accustomed to fix it, and I am inclined to think that Mr. Alder will ultimately find that she has not, as he states, placed the "inhalant siphon" "before instead of behind."

This idea of inverting the invariable order of nature to account for an anomaly in the structure of *Kellia rubra* is a stretch of imagination, far beyond my conjecture, that the fold in question may be to assist locomotion. But I shall not be surprised to find that Mr. Alder and myself have mistaken the use of this fold in *Kellia rubra*, and that it may minister to supply water to the viviparous colony deposited in the ovarium of the animal of this species, and also act as an oviduct and receptacle for the young, until they are sufficiently developed for exclusion. This idea arises from having seen, when examining some *Kellia suborbicularis* in a saucer, several *testaceous* young ejected from the anomalous tube of one of the animals, which I find, as Mr. Alder states, is entire, and not an open fold as in *Kellia rubra*; these I immediately gathered up, and have them now by me. I mentioned some time ago this circumstance to Professor Forbes; but notwithstanding this fact, I have never been able to discover, in any of the very numerous ovaria of this species I have examined, anything but ova, but it is exceedingly probable the shells I saw ejected may have been deposited in the curious and extraordinary appendage in this animal, and there received the development in which I found them.

As to Mr. Alder's other observations, on some quotations from my last paper, I leave them as I find them. I really have some difficulty in appreciating their scope, aim and applicability; indeed some of them are so involved as not to be clear. I therefore beg him to accept the following new demonstration of the fallacy of the inhalant and exhalant branchial currents in the bivalves

having separate apertures, as an acquittance on account of those parts of his observations which I have neglected to notice, and which, if established, will I am sure be considered by that gentleman as a sufficient answer.

I propose to demonstrate that the water for branchial, as well as alimentary purposes, passes into the branchial cavity by *both* the posterior siphons, in conjunction with the pedal aperture in those animals in which the ventral range is sufficiently open, and is expelled indiscriminately in various proportions from all the apertures I have mentioned.

It appears entirely to have escaped Mr. Alder's observation that the posterior siphons of all bivalves have other functions besides the conveyance of water to the branchiæ, and that they are also furnished with most important organs of prehension, for providing for the animal's sustentation; these are the tentacular cirrhi and cilia which clothe both the anal and branchial siphons of a great majority of the bivalve mollusca, to entangle and capture the minute animalculæ to be conveyed into the branchial cavity: how, and by what means, is this operation to be accomplished? I answer, through both the posterior ciliated siphons, by the agency of the currents of water, which enter and thus enable them to deposit within the branchial walls the prey which *each* cirrhigerous siphon has captured. We cannot suppose that nature has furnished the siphons of the animals with organs for taking their prey, without at the same time providing the means of conveying it into the branchial cavity, and there cannot be any other than the passage of the water through *each* siphon. We have here irrefragable proof that both the posterior siphons are subservient to provide the animal with water for branchial and alimentary uses.

The *Pectines*, *Anomiæ*, and *Ostreæ* also indisputably prove the fallacy of Mr. Alder's doctrine of distinct apertures of ingress and egress for the branchial currents, as in these genera the animals have only one immense aperture, which extends nearly throughout the periphery of the shell, consequently the water can only enter into and issue from the same aperture.

The only other point I must notice is Mr. Alder's assertion that I have "overstated" the tidal range of *Kellia rubra*. What I said with respect to the habitat of this species, was from the recollections of fifteen years ago. I visited the locality a few days since, and again this day, with a person well acquainted with the coast, who called in to assist his judgement another individual, who informed me that the rock from which I took in their presence *Kellia rubra*, is often not covered with water for a fortnight at a time in calm weather: therefore, as I stated in my last paper, the washing of the bases and sides of the rocks suffices

to supply moisture to prevent the desiccation of the branchiæ of *Kellia rubra*, as well as those of the *Littorina jugosa* and *petræa*, and of the *Patellæ* and *Mytili*, which, in many situations, are not submerged throughout the year; and I can affirm that I saw hundreds of some of the animals I have named from *ten* to *twenty* feet above the level of the highest spring-tide at any period of the year. How these animals exist is a mystery; it is possible the saline particles in the air, and the fine spray carried by the winds to the rocks on which these animals are found, may supply sufficient moisture for the branchiæ; but can the animal from these materials extract sustentation? There is no appearance of their descent to lower levels; they appear to be fixtures; and I am informed they are to be found in the same situation in all seasons. As for *Kellia rubra*, they exist in myriads in all the higher levels of the littoral zone, but in the very lowest they are not submerged for four hours during the twenty-four.

These facts invalidate the doctrine of the branchial currents by cilia, and their having separate apertures of ingress and egress; for what can be the use of them in *Kellia rubra*, when they necessarily must be interrupted for twenty hours out of the twenty-four throughout the year? It seems strange, according to Mr. Alder, that a special branchial organ should be furnished by nature for a bivalve, which can better dispense with such a specialty than any other in existence.

With my best thanks for your liberal insertion of my papers in the 'Annals,'

I remain, Gentlemen, your most obedient servant,

William Clark.

Postscript.—To corroborate the conjecture stated above of the real uses of the anterior tubes of *Kellia rubra* and *Kellia suborbicularis*, I beg to add, that I have just examined a fine *Kellia suborbicularis*. I placed it on the umbones; it immediately exserted and opened the tube, and by the aid of a powerful lens I counted at its fundus fifteen largely developed ova, and I have not the slightest doubt that these anomalous animals, as regards reproduction, are furnished with these anomalous tubes to minister thereto; and I have further to state, that on submitting this animal to my scalpel and to one of Mr. Ross's best microscopes, I received the fullest confirmation of my conjectures, having found at the bottom of the ovarium resting on the fundus of the tube, ova in all states of development and *fully-formed testaceous young*. I have carefully preserved the shell and ovarium. Therefore *Kellia rubra* and *Kellia suborbicularis* are undoubtedly viviparous; the only difference between the two is, that the young in *Kellia rubra* are fully developed in the ovarium, and only require the open tube-like fold for an oviduct, and to convey water to

the pulli, whilst *Kellia suborbicularis* requires the tube to be closed, as it is for some time a nidus for the full development of the testaceous young.

I am at this moment enabled to add, that I have just opened a very large *Kellia suborbicularis* having the contents of the ovarium converted from its usual ova-like aspect into many thousands of completely testaceous young further to be developed before exclusion from the anomalous oviduct.

The reason why this state of the ova has so often escaped detection is, that the ovarium has not been examined at the *genial* season. To see it as I have stated, we must attend to the injunction of C. Lucretius—

"Ætheris et terræ *genitabile* quærere tempus."

I have on a card many thousands of the testaceous young taken from the matrix of the individual above mentioned, a part of which I shall have much pleasure in forwarding to any gentleman who may desire it.

It gives me great pleasure that the question of the use of the anomalous tubes is at length set at rest, and the discussion as to them between Mr. Alder and myself is ended.

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

June 27, 1848.—William Yarrell, Esq., V.P., in the Chair.

DESCRIPTION OF FOURTEEN NEW SPECIES OF HELICEA, FROM THE COLLECTION OF H. CUMING, ESQ. BY DR. L. PFEIFFER.

1. HELIX VITELLINA, Pfr. *Hel. testâ angustissimè umbilicatâ, depresso-globosâ, supernè minutissimè decussatâ, vix nitidâ, fusces-centi-vitellinâ; spirâ breviter conoideâ, obtusiusculâ; anfractibus* $5\frac{1}{2}$ *convexiusculis, ultimo anticè subdescendente, infra peripheriam vix striato, juxta umbilicum contractum albo; aperturâ obliquâ, lunato-rotundatâ; peristomate simplice, marginibus remotis, columellari albo, incrassato-reflexo, supernè subdilatato.*

Diam. 29, altit. 18 mill.

Locality unknown.

2. HELIX GEMMA, Pfr. (*Vitrina suturalis*, Beck MSS.) *Hel. testâ subperforatâ, conoideo-orbiculatâ, tenui, lævigatâ, nitidâ, pellucidâ, virenti-hyalinâ; spirâ depresso-conoideâ; suturâ submarginatâ; anfractibus* 4 *vix convexiusculis, sensim accrescentibus, ultimo non descendente; aperturâ parùm obliquâ, rotundato-lunari; peristomate simplice, recto, margine columellari brevi, arcuato, supernè reflexiusculo.*

Diam. 9, altit. 5 mill.

From the islands of Luzon and Camiguing; collected by Mr. Cuming.